ABM Specialty Taxa Husbandry

Centrolenids (Glass Frogs) version 1 April 2008

Robert Hill and Ron Gagliardo
Atlanta Botanical Garden

The purpose of the Specialty Taxa Monograph is to provide more information on husbandry and breeding of different taxa that may be encountered in amphibian collections. It is intended to be an addendum to the Basic Husbandry Monograph, where basic principles are addressed. Some husbandry specifics are based on experience at the Atlanta Botanical Garden (ABG) and others may experience different results.

1) Basic morphology and natural history

Centrolenids (Glass Frogs) are endemic to Central and South America. There are over 140 species described to date contained in 4 genera that range from southern Mexico to Bolivia (Cisneros-Heredia, and McDiarmid, 2007; Savage 2002). As the common name implies, they have particularly thin, transparent skin allowing observation of some internal organs and fragile skeletal structure. They are generally very small in size (2 to 8 cm) and strictly nocturnal. They have large eyes that make up a good portion of the head. One interesting characteristic of the eyes is the 45-degree angle orientation that allows them binocular vision. (Kubicki 2007). Centrolenids typically dwell in vegetation along streams, so they are very much dependent on water. Eggs masses consisting of 10 to 60 individual eggs are deposited on leaves over hanging streams and tadpoles drop in upon hatching. In some species, the male guards these egg masses. Aggression and combat among males has been documented in nature, but little is known about this under captive conditions. Eel-like centrolenid larvae are quite benthic in nature, spending most of the time in submerged leaf litter in small calm pools at the edges of streams. The water quality of these locations is poor and it is thought that the red coloration of centrolenid larvae is due to increased blood circulation, attempting to exchange more oxygen from the water.

2) Justifications/Uses/Purposes

Over 1/3 of centrolenid species are considered critically endangered or threatened (IUCN, Conservation International, and NatureServe. 2008). Learning as much about the husbandry and breeding of this group of frogs, starting with species that are not yet threatened will assist in conservation efforts for others in the future. Most do not make good specimens for public display due to their nocturnal habits; however, they have excellent potential for more specific, one-on-one educational use and exhibit interesting behavior in captivity.

3) General Husbandry

a) Physical parameters

1. Enclosures: Vertically oriented enclosures are best. No smaller than 20 gal. “high” for groups of 1.1 or more.

2. Furnishings that address natural history aspects: An abundance of smooth, broad-leaf tropical plants along with a large grouping of smaller plants for additional cover. Majority of leaves should overhang water as egg deposition sites.

3. Any other special features? See Water section

b) Environmental considerations

1. Temperature**:** 70-78 degrees F daytime with a 5-10 degree drop at night

2. Water (humidity, running water, etc.)
If possible, the majority of enclosure floor should be water, but only about 2-4 cm in depth and with adequate means of escape such as rocks or plant material. Humidity should be maintained at very high levels at all times. Misters running multiple times daily will assist with this. Also, some form of constantly moving/dripping water should be provided. Can be as simple as water being pumped from the bottom to the top via a small powerhead-type pump and a tube to an elaborate waterfall.

3. Light
Generally, power compact or other fluorescent lights needed to sustain vigorous plant growth is fine for centrolenids. Eiko® Halogen spot lights can be provided for UV absorption, but should be used sparingly so as not to increase the temperatures or decrease humidity too much. Also, it is unclear what the UV requirements are for this and other amphibian taxa, so we should always be cautious in this regard. **These frogs are highly subject to desiccation especially with localized high temperatures!**

4. Modifications to induce breeding? In the setups described above, breeding in captivity seems to take place mostly in spring and summer without any additional modifications. In nature, they are opportunistic breeders, where intermittent dry periods followed by rain events stimulate breeding.

c) Feeding, Nutrition, Veterinary Considerations:

Although in the terrarium, centrolenids seem to prefer flying insects, diet should stay varied, but the three main staples consist of gut-loaded small crickets (1/8-1/4 inch), Drosophila, and Houseflies (for larger species). Food items should be dusted alternately with powdered vitamin supplement of known formulation (we have been using a commercially available Men's Health vitamin which is pulverized to powder form) and calcium supplement (we use Rep-Cal with Vitamin D3). Newly metamorphosed frogs will normally accept *Drosophila melanogaster* and in some cases even *D. hydei* as their first meals. A good use of the occasional "flier" culture of fruit flies is to place the entire culture in the enclosure with a small hole in lid to allow flies to emerge and fly out.

Common veterinary concerns are lungworm (*Rhabdia*s sp.) and other nematode infections. They show no particular sensitivity to Drontal Plus® as a dewormer although it's effectiveness against *Rhabdias* is not 100%.

4) Raising of Larva/Neonates:

a) Eggs:

Clutch size can range from 10-60 eggs. In most cases, egg masses are removed upon discovery. Simply remove the leaf the mass is laid on. The leaf/egg mass combo can then be placed in a plastic container with some water on the bottom, but not enough to completely immerse the eggs. Containers with eggs are stored at approximately 75 degrees F. under normal lighting conditions. If a few of the eggs slip into the water, this is generally of no concern and they should still develop normally. Hatching takes roughly 2-4 weeks. Most eggs will not hatch all at once and the last eggs to hatch may not do so until 2 weeks after the first.

b) Larva:

There are two methods that have proven quite successful at the Atlanta Botanical Garden:

1) Aquarium: This method employs a 10-gallon aquarium. A fine sand substrate is added to a depth of ½-1 inch deep. Several small rocks are also added as well as a few live aquatic plants. A very small powerhead or filter/pump combo is added to keep the water slowly moving simulates the moving water of a stream. The tadpoles will use the sand, rocks, and plants as refugia. In this set up, the tank should be allowed to cycle for 2-3 weeks prior to adding any larvae. Do not be concerned if you don't see them for some time after they are introduced. The larvae will almost immediately seek out shelters and will only rarely reveal themselves for the first several weeks or even months. A weekly water change of 25-30% is recommended.

2) Simple Tubs: Here, plastic "shoeboxes" such as 6-quart size Sterilite® boxes are used in place of the aquarium. A very thin layer of fine sand (1/8 inch) or gravel is added as a substrate, again combined with a few small rocks. Live java moss is added for additional cover. The tub is filled ¾ of the way with filtered water. No powerheads are used and the tubs merely need to sit for a couple of hours to stabilize to room temperature. Tadpoles may be added at this point and will quickly seek shelter. A water change of 50-60% should be performed at least once weekly.

NOTE: When doing water changes in either method, resist the urge to completely scrub the sides and rocks clean of algae as normal algae growth on these surfaces supplies additional food resources.

Feeding: The diet of centrolenid larvae at ABG consists mainly of sera-micron pasted onto microscope slides. Fresh slides should be offered and old slides removed on a daily basis. Hikari Sinking Wafers show some promise, as the larvae eat them eagerly, however they seem to foul the water more quickly.

Metamorphs: This is perhaps the most protracted process of breeding centrolenids. In fast cases, tadpoles will begin metamorphosis at about 6 months, with most not beginning the process until their 8th, 9th, or even 10th month. Once the hind limb buds appear, it may still be a couple of months before the front limbs emerge. Once they have all four limbs, metamorphs at ABG are removed from the rearing tanks/tubs and placed in 32 oz deli cups with vented lids. A tall leaf if placed on a slant inside the cup to provide a haul out point. The cup should also have roughly ¼ inch of water in the bottom. The tail will take quite a while to be absorbed (several weeks in some cases) and the metamorph may be very reluctant to leave the water. As long as there is an adequate haul out area, though, this should pose no problems. Once it has emerged from the water, a small layer of sphagnum moss is added to the cup so that there is no longer a pool of water. Once out of the water for about 10-14 days the tail should start to be absorbed and feeding can commence. First meals are usually 2-3 *Drosophila melanogaster*. Be careful not to feed too many flies at once as the neonates are easily stressed by a large amount of food items in the enclosure. Mist daily and feed every other day. After the first few delicate weeks, raising the froglets is very straightforward. Most centrolenids reach sexual maturity within one year.

References and Suggested Reading

Cisneros-Heredia, D. F., and McDiarmid, R.W. 2007. Revision of the characters of Centrolenidae (Amphibia: Anura: Athesphatanura), with comments on its taxonomy and the description of new taxa of glassfrogs. *Zootaxa* 1572, pp. 1-82.

IUCN, Conservation International, and NatureServe. 2008. Global Amphibian Assessment. <www.globalamphibians.org>. Downloaded April 1, 2008.

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